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EXAMINER	
CHANG, CHING	
ART UNIT	**PAPER NUMBER**
3748	

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/810,538	FROESCHLE ET AL.	
	Examiner	Art Unit	
	Ching Chang	3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 August 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) *3,10,20,27-30,37-43 and 55* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-9,11-19,21-26,31-36 and 44-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *3/26/2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/05/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the Remarks filed on 08/05/2005.

Specification

1. The disclosure is objected to because of the following informalities:

- " armature assembly 64 " through the whole Specification (e.g. in line 8, Page 14) should be -- armature assembly 66 --.

Appropriate corrections are required. The same requirement has been set forth in the Office Action mailed on 05/03/2005.

Drawings

2. This Office acknowledges the replacement drawing sheets of Figs. 4E-4F received on 08/05/2005, however, the corrected drawing sheets of other objected drawings, as being set forth on the Draftperson's Patent Drawing Review (PTO-948, a copy of which is attached to the Office Action mailed on 05/03/2005), in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after

the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claim 13 is objected to because of the following informalities:

- " parallel l " in claim 14 should be -- parallel --.

Appropriate correction is required. The same requirement has been set forth in the Office Action mailed on 05/03/2005.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. ***Claims 1-2, 4-9, 11-19, 21, 32, 35, and 44-47 are rejected under 35 U.S.C. 102(b) as being anticipated by Hoppie (US Patent 6,039,014).***

Hoppie discloses an electromagnetic actuator (See Figs 1-5, and 7), comprising: a stator assembly (50; 120; 164) having an inner surface that defines an opening, the

stator assembly comprising: a coiled conductor (52; 126; 162) disposed near the inner surface of the stator assembly, wherein the coiled conductor is adapted to generate a first magnetic field when current is applied; a center pole formed of a material (60; 118; 192) having high magnetic permeability and having a longitudinal axis; and an armature assembly (56; 112; 174) at least partially disposed within the stator assembly opening, the armature assembly comprising: a permanent magnet (58; 116; 190), wherein the armature assembly moves in a direction parallel to the longitudinal axis of the center pole when current is applied to the coiled conductor assembly; wherein the magnet is radially magnetized; wherein adjacent coils are configured to generate magnetic fields having opposite polarity; wherein the plurality of coils are connected in series; wherein adjacent coils are wound in opposite directions; wherein the stator assembly further comprises one or more back iron members formed of a material having high magnetic permeability; wherein the permanent magnet is ring-shaped and defines longitudinal axis that is parallel with the longitudinal axis of the center pole; wherein the longitudinal axis of the permanent magnet is coaxial with the longitudinal axis of the center pole; wherein the stator assembly defines a longitudinal axis that is parallel to the longitudinal axis of the center pole; where in the longitudinal axis of the stator assembly is coaxial with the longitudinal axis of the center pole; wherein the permanent magnet is radially magnetized (See Fig. 5); wherein the magnet has one or more discontinuities such that the dominant eddy current path is interrupted; wherein the permanent magnet comprises a plurality of arc-shaped segments; wherein the armature assembly further comprises a valve stem (64) adapted to open or close a valve when current is applied to

the coiled conductor; wherein the armature assembly further comprises: a means (See Figs. 1, 5, and 7) for coupling the valve stem to the remainder of the armature assembly; wherein the center pole is formed of a paramagnetic material; wherein the center pole is at least partially formed of ferromagnetic material; a controller (24) configured to receive information about one or more operating states of the valve and apply a control signal to the coil to generate a magnetic field that causes the armature assembly to move relative to the longitudinal axis of the center pole, wherein the control signal is based on the information about one or more operating states of the valve (See Col. 4, line 65 through Col. 5, line 64); wherein the one or more operating states comprises valve velocity; wherein the one or more operating states comprise valve position; wherein the controller receives information about both the velocity and position of the valve and selectively applies a velocity feedback control and a position feedback control to position the valve.

6. ***Claims 1-2, 4-9, 11-19, 21, 25-26, 31-32, and 35 are rejected under 35 U.S.C. 102(e) as being anticipated by Grundl et al. (US Patent 6,755,161).***

Grundl discloses an electromagnetic actuator (See Figs 1-6), comprising: a stator assembly (40) having an inner surface that defines an opening, the stator assembly comprising: a coiled conductor (18', 28) disposed near the inner surface of the stator assembly, wherein the coiled conductor is adapted to generate a first magnetic field when current is applied; a center pole (18", 18"') formed of a material having high magnetic permeability and having a longitudinal axis; and an armature assembly (16) at least partially disposed within the stator assembly opening, the

armature assembly comprising: a permanent magnet (30), wherein the armature assembly moves in a direction parallel to the longitudinal axis of the center pole when current is applied to the coiled conductor assembly; wherein the magnet is radially magnetized; wherein adjacent coils are configured to generate magnetic fields having opposite polarity; wherein the plurality of coils are connected in series; wherein adjacent coils are wound in opposite directions; wherein the stator assembly further comprises one or more back iron members formed of a material having high magnetic permeability; wherein the permanent magnet is ring-shaped and defines longitudinal axis that is parallel with the longitudinal axis of the center pole; wherein the longitudinal axis of the permanent magnet is coaxial with the longitudinal axis of the center pole; wherein the stator assembly defines a longitudinal axis that is parallel to the longitudinal axis of the center pole; where in the longitudinal axis of the stator assembly is coaxial with the longitudinal axis of the center pole; wherein the permanent magnet is radially magnetized (See Fig. 5); wherein the magnet has one or more discontinuities such that the dominant eddy current path is interrupted; wherein the permanent magnet comprises a plurality of arc-shaped segments; wherein the armature assembly further comprises a valve stem (64) adapted to open or close a valve when current is applied to the coiled conductor; wherein the armature assembly further comprises: a means (See Figs. 1, 2a, 3, and 4) for coupling the valve stem to the remainder of the armature assembly; wherein the armature assembly further comprises one or more spacers (44) disposed between each of the permanent magnets; wherein the magnets and spacers are split in the axial direction; wherein the axial height of the magnet is greater than the

axial height of the coiled conductor; wherein the center pole is formed of a paramagnetic material; wherein the center pole is at least partially formed of ferromagnetic material.

7. ***Claims 48-52 are rejected under 35 U.S.C. 102(b) as being anticipated by Hoppie (US Patent 6,039,014).***

Hoppie discloses an internal combustion engine (22) comprising: a cylinder (36) that defines a chamber; a valve (30) adapted to control the flow of a liquid or a gas into or out of the chamber; an electromagnetic actuator (28; 160; 200) coupled to the valve, the actuator comprising: a stator assembly (50; 120; 164) having an inner surface that defines an opening, the stator assembly comprising: a coiled conductor (52) disposed near the inner surface of the stator assembly, wherein the coiled conductor is adapted to generate a first magnetic field when current is applied; a center pole formed of a material (60; 118; 192) having high magnetic permeability and having a longitudinal axis; and an armature assembly (56; 112; 174) at least partially disposed within the stator assembly opening, the armature assembly comprising: a permanent magnet (58; 116; 190), wherein the armature assembly moves to open or close the valve when current is applied to the coiled conductor assembly; the said engine further comprising: a controller (24) configured to receive information about one or more operating states of the valve and apply a control signal to the coil to generate a magnetic field that causes the armature assembly to move relative to the longitudinal axis of the center pole, wherein the control signal is based on the information about one or more operating states of the valve (See Col. 4, line 65 through Col. 5, line 64); wherein the one or more

operating states comprises valve velocity; wherein the one or more operating states comprise valve position; wherein the controller receives information about both the velocity and position of the valve and selectively applies a velocity feedback control and a position feedback control to position the valve.

8. ***Claims 1-2, 4-9, 11-16, 19, 21, 32, 35, and 44-47 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawamura (US Patent 5,124,598).***

Kawamura discloses an electromagnetic actuator (See Figs1-2), comprising: a stator assembly (3) having an inner surface that defines an opening, the stator assembly comprising: a coiled conductor (36-39) disposed near the inner surface of the stator assembly, wherein the coiled conductor is adapted to generate a first magnetic field when current is applied; a center pole (71) formed of a material having high magnetic permeability and having a longitudinal axis; and an armature assembly (22, 23) at least partially disposed within the stator assembly opening, the armature assembly comprising: a permanent magnet (2), wherein the armature assembly moves in a direction parallel to the longitudinal axis of the center pole when current is applied to the coiled conductor assembly; wherein the magnet is radially magnetized; wherein adjacent coils are configured to generate magnetic fields having opposite polarity; wherein the plurality of coils are connected in series; wherein adjacent coils are wound in opposite directions; wherein the stator assembly further comprises one or more back iron members formed of a material having high magnetic permeability; wherein the permanent magnet is ring-shaped and defines longitudinal axis that is parallel with the longitudinal axis of the center pole; wherein the longitudinal axis of the permanent

magnet is coaxial with the longitudinal axis of the center pole; wherein the stator assembly defines a longitudinal axis that is parallel to the longitudinal axis of the center pole; where in the longitudinal axis of the stator assembly is coaxial with the longitudinal axis of the center pole; wherein the permanent magnet is radially magnetized (See Fig. 1-2); wherein the armature assembly further comprises a valve stem (See Fig. 1) adapted to open or close a valve when current is applied to the coiled conductor; wherein the armature assembly further comprises: a means (See Fig. 1) for coupling the valve stem to the remainder of the armature assembly; wherein the center pole is formed of a paramagnetic material; wherein the center pole is at least partially formed of ferromagnetic material; a controller (5) configured to receive information about one or more operating states of the valve and apply a control signal to the coil to generate a magnetic field that causes the armature assembly to move relative to the longitudinal axis of the center pole, wherein the control signal is based on the information about one or more operating states of the valve (See Col. 4, line 15 through Col. 6, line 2); wherein the one or more operating states comprises valve velocity; wherein the one or more operating states comprise valve position; wherein the controller receives information about both the velocity and position of the valve and selectively applies a velocity feedback control and a position feedback control to position the valve.

9. ***Claims 48-52 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawamura (US Patent 5,124,598).***

Kawamura discloses an internal combustion engine (6) comprising: a cylinder that defines a chamber; a valve (1) adapted to control the flow of a liquid or a gas into or out of the chamber; an electromagnetic actuator (See Fig. 1) coupled to the valve, the actuator comprising: a stator assembly (3) having an inner surface that defines an opening, the stator assembly comprising: a coiled conductor (36-39) disposed near the inner surface of the stator assembly, wherein the coiled conductor is adapted to generate a first magnetic field when current is applied; a center pole (71) formed of a material having high magnetic permeability and having a longitudinal axis; and an armature assembly (22, 23) at least partially disposed within the stator assembly opening, the armature assembly comprising: a permanent magnet (2), wherein the armature assembly moves to open or close the valve when current is applied to the coiled conductor assembly; the said engine further comprising: a controller (5) configured to receive information about one or more operating states of the valve and apply a control signal to the coil to generate a magnetic field that causes the armature assembly to move relative to the longitudinal axis of the center pole, wherein the control signal is based on the information about one or more operating states of the valve (See Col. 4, line 15 through Col. 6, line 2); wherein the one or more operating states comprises valve velocity; wherein the one or more operating states comprise valve position; wherein the controller receives information about both the velocity and position

of the valve and selectively applies a velocity feedback control and a position feedback control to position the valve.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. ***Claims 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoppie (as applied to claim 19 above) in view of Mackal (US Patent 5,135,025).***

Hoppie discloses the invention, however, fails to disclose the said valve stem comprising a ball-shaped tip and being received by a ball joint of said armature assembly.

The patent to Mackal on the other hand, teaches that it is conventional in the valve art, to utilize a valve having a ball-shaped tip and being received by a ball joint assembly (16, 28)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the ball joint assembly as taught by Mackal in the Hoppie device, since the use thereof would provide an improved electromagnetic valve actuator which would make the valve stem to have side or rotational movement relative to the longitudinal axis of the center pole.

12. ***Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoppie (as applied to claim 1 above) in view of Modien (US Patent 6,845,762).***

Hoppie discloses the invention, however, fails to disclose the force of the armature as a function of displacement of the armature relative to the stator assembly is substantially constant over an intended range of excursion, and detent force profile of the actuator as a function of displacement of the armature relative to the stator assembly is substantially zero over an intended excursion range of displacement.

The patent to Modien on the other hand, teaches that it is conventional in the electromagnetic actuator art, to utilize an armature (135) configured in an electromagnetic actuator (60) to achieve the force of the armature as a function of displacement of the armature relative to the stator assembly is substantially constant over an intended range of excursion, and detent force profile of the actuator as a function of displacement of the armature relative to the stator assembly is substantially zero over an intended excursion range of displacement (See Fig. 3).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the armature configuration as taught by Modien in the Hoppie device, since the use thereof would provide an improved electromagnetic actuator with less energy consumption in operation.

13. ***Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hoppie (as applied to claim 1 above) in view of Iida et al. (US Patent 6,679,204).***

Hoppie discloses the invention, however, fails to disclose a cooling jacket being disposed at least partially around the said stator assembly.

The patent to Iida on the other hand, teaches that it is conventional in the electromagnetic actuator art, to utilize a cooling circuit (38, 39; See Col. 4, line 57 through Col. 5, line 2) including a cooling jacket (22, 38) disposed around an electromagnetic actuator (23).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the cooling jacket to be disposed around the electromagnetic actuator as taught by Iida in the Hoppie device, since the use thereof would provide an engine with an improved electromagnetic valve actuator, without overheating during its operation.

14. ***Claims 53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoppie (as applied to claim 48 above) in view of Iida et al. (US Patent 6,679,204).***

Hoppie discloses the invention, however, fails to disclose a cooling circuit being configured to cool the said actuator.

The patent to Iida on the other hand, teaches that it is conventional in the electromagnetic actuator art, to utilize a cooling circuit (38, 39; See Col. 4, line 57 through Col. 5, line 2) including a heat exchanger, a pump, and a cooling jacket (22, 38) to cool an electromagnetic actuator (23)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the cooling circuit as taught by Iida in the Hoppie device, since the use thereof would provide an engine with an improved electromagnetic valve actuator, without overheating during its operation.

15. ***Claims 53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura (as applied to claim 48 above) in view of Iida et al. (US Patent 6,679,204).***

Kawamura discloses the invention, however, fails to disclose a cooling circuit being configured to cool the said actuator.

The patent to Iida on the other hand, teaches that it is conventional in the electromagnetic actuator art, to utilize a cooling circuit (38, 39; See Col. 4, line 57 through Col. 5, line 2) including a heat exchanger, a pump, and a cooling jacket (22, 38) to cool an electromagnetic actuator (23)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the cooling circuit as taught by Iida in the Kawamura device, since the use thereof would provide an engine with an improved electromagnetic valve actuator, without overheating during its operation.

Response to Arguments

16. Applicant's arguments filed on 08/05/2005 have been fully considered but they are not persuasive.

More specifically, the Applicants' traversal on the election/restriction requirement is not persuasive, the election/restriction requirement remains the same as being set forth in the Office Action mailed on 05/03/2005.

Furthermore, regarding the Attorney's contention " "a center pole formed of material having high magnetic permeability," a feature absent from the reference " (e.g., See Page 4, Attorney's Remarks), the Examiner disagrees. As a matter of fact, the Hoppie reference discloses a center pole formed of a ferromagnetic material (60; 118; 192), the Grundl reference discloses a center pole formed of a soft magnetic form body 18", 18"' (See Col. 9, line 64 through line 66), and the Kawamura reference discloses a center magnetic pole 71, in addition, it is also admitted in this instant application, " a material having high magnetic permeability (e.g., a ferromaretic or paramagnetic material) " (See line 11 through line 12, Page 1 of the Specification). Accordingly, the Examiner would deem that either one of the Hoppie reference, the Grundl reference, or the Kawamura reference teaches a center pole formed of material having high magnetic permeability.

Furthermore, In response to applicants' arguments, on the 35 U.S.C. 103(a) rejections to claims 22-24, 33-34, 36, and 53-54, that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re*

Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this instant case, as aforementioned, either one of the primary reference, the Hoppie reference or the Kawamura reference, has shown the teaching of a center pole formed of a material having high permeability, accordingly, the Examiner deems that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the teachings in either one of the Mackal reference, Modien reference, or Iida referenc (e.g., a cooling circuit taught by Iida) in the Hoppie device or the Kawamura device, since the use thereof would provide a more energy efficient electromagnetic valve actuator.

Conclusion

17. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ching Chang whose telephone number is (571)272-4857. The examiner can normally be reached on M-Th, 7:00 AM -5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Denion can be reached on (571)272-4859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patent Examiner

Ching Chang

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